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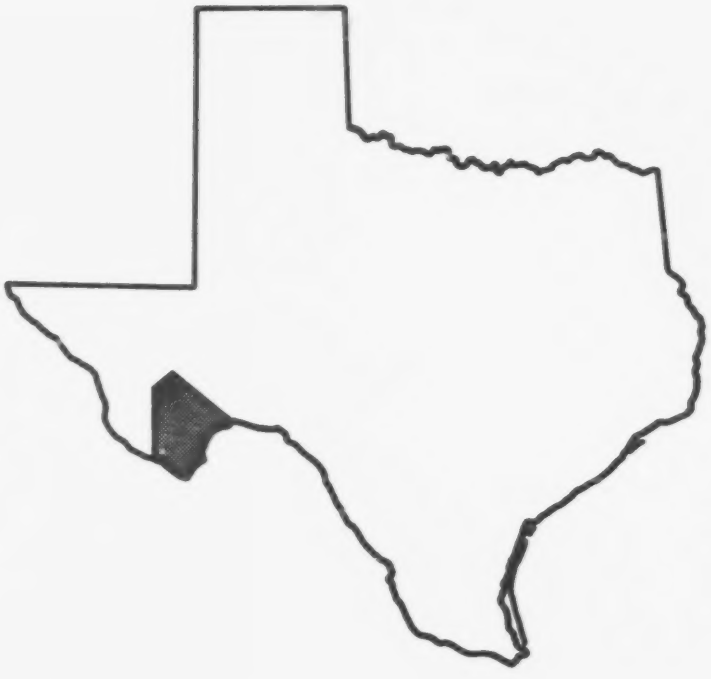
FEMI. 2-09: 480085

FLOOD INSURANCE STUDY

CITY OF ALPINE, TEXAS
BREWSTER COUNTY



NOVEMBER 16, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER - 480085

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Flood Insurance Study Effective Date: November 16, 1990

Flood Insurance Study Revised:

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FLOOD INSURANCE STUDY
CITY OF ALPINE, BREWSTER COUNTY, TEXAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Alpine, Brewster County, Texas, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the U. S. Geological Survey (USGS) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-87-E-2512. This work was completed in September 1988.

1.3 Coordination

On December 10, 1986, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the city, and the USGS (the study contractor) to determine the streams to be studied by detailed methods.

On August 28, 1989, a final CCO meeting was held with representatives of FEMA, the city, and the study contractor to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Alpine, Brewster County, Texas. Two Unincorporated Areas of Brewster County are located within the City of Alpine, but are not included in this study. The area of study is shown on the Vicinity Map (Figure 1).

The limits of study for the streams studied by detailed methods are shown in the following tabulation.

Stream	Limits of Detailed Study
Alpine Creek	From the downstream corporate limits to a point approximately 150 feet downstream of the upstream corporate limits
West Moss Creek	From its confluence with Alpine Creek to the upstream corporate limits
Tributary 1	From its confluence with Alpine Creek to the upstream corporate limits
Toronto Creek	From a point approximately 0.33 mile downstream of the State Route 118 crossing on the northeast side of the city to a point approximately 0.2 mile upstream of State Route 118
Tributary 3	From a point approximately 1,380 feet upstream of its confluence with Toronto Creek to the upstream corporate limits
Moss Creek	For its entire length within the community

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through September 1993.

Toronto Creek and Alpine Creek were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the City of Alpine.

2.2 Community Description

The City of Alpine is located in the northwest portion of Brewster County, in the extreme western portion of Texas, approximately 220 miles southeast of El Paso and 103 miles north of Big Bend National Park. It is completely surrounded by the unincorporated areas of

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALPINE, TX

(BREWSTER CO.)

APPROXIMATE SCALE

1.5 0 1.5 3 4.5 MILES

VICINITY MAP

Brewster County. The population was 5,465 in 1982 (Reference 1). The developed areas of the city are stabilized, and several areas are expected to experience new development in the near future.

2.3 Principal Flood Problems

The most serious potential for flood damage in the City of Alpine is in the overbank areas along Alpine Creek, which is the principal drainage basin for the most densely populated residential and commercial areas of the city. The potential for flood damage along West Moss Creek is considered to be moderate to high. West Moss Creek originates at a point of breakout flow from Moss Creek, a short distance to the southwest of the city, and flows across the central residential and commercial portion of the city until it merges with Alpine Creek in the Kokernot Golf Course area. There is an area of crossover flow between West Moss and Alpine creeks that creates an additional area of residential and commercial flooding in the central portion of the city when discharges exceed those of the 100-year flood.

The flood damage potential for Moss Creek will be low to moderate, since it flows through areas to the east and southeast of the city that are presently vacant or mostly industrial.

Toronto Creek, which flows across the northern edge of the city, has a moderate to high potential for flood damage to the existing residential areas as well as planned future developments along its banks. The segment of Toronto Creek that lies downstream of the State Route 118 North crossing has no channel definition and the flow will be rather shallow with moderate velocities.

Tributary 3 has a moderate potential for flood damage. Only scattered residential development exists presently, but additional development is planned in the near future.

Tributary 1 has a moderate flood damage potential for approximately two thirds of its length, in the lower portion, and a very low potential for flood damage in the remaining portion. Tributary 1 flows along the south side of the Southern Pacific Railroad embankment for its entire length. From its point of origin at a culvert under the railroad embankment at the upstream end of Tributary 3, it breaks out from the Twin Sisters Mountain drainage basin and flows downstream to its confluence with Alpine Creek, in the vicinity of South 11th Street.

2.4 Flood Protection Measures

FEMA specifies that all levees must have a minimum of 3 foot freeboard against 100-year flooding to be considered a safe flood protection structure. Levees exist in the study area that provide the community with some degree of protection against flooding.

However, it has been ascertained that the earthen levee along Tributary 3 may not protect the community from rare events such as the 100-year flood. The criteria used to evaluate protection against the 100-year flood are 1) adequate design, including freeboard, 2) structural stability, and 3) proper operation and maintenance. Levees that do not protect against the 100-year flood are not considered in the hydraulic analysis of the 100-year floodplain.

The earthen levees that exist along portions of Tributary 3 is intended to direct floods of lower frequencies from the populated areas. The levee is located along the southeast side of Tributary 3 from the Southern Pacific Railroad downstream for a distance of approximately 3,000 feet. This levee is overtopped by the 100-year flood for the portion of its length downstream of a point just below U. S. Route 90 West.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

The hydrologic analyses for West Moss Creek, Moss Creek, and Alpine Creek were taken from the Soil Conservation Service (SCS) report Summary of Hydrologic and Hydraulic Procedures Used to Analyze Flooding in the Alpine Creek Watershed Area (Reference 2). Peak

discharges for the 100-year flood were computed for these streams using the TR-20 computer program (Reference 3). This program was calibrated using information from a U. S. Army Corps of Engineers (COE) report and gage analyses from applicable gages. 24-hour duration storm rainfall amounts were obtained from Weather Bureau Technical Paper No. 40 for the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year storms. A log-probability plot was developed using these rainfall amounts and the 500-year, 24-hour storm rainfall was extrapolated from this plot. The soil cover complex curve number was determined to be 80 for present and future conditions assuming AMC II condition. Times of concentration were computed using Hathaway's Method. Estimated routing coefficients were used for the upper incremental drainage areas where rated (stage-discharge-area) valley sections were not available. Where available, rated valley sections were used for routing storms downstream. Antecedent Moisture Condition (AMC) 1, which assumes dry conditions, was used. The SCS Type II rainfall storm distribution was used for evaluation. The point of breakout from Moss Creek to West Moss Creek, which first occurred at the 50-year storm frequency, was taken into consideration in the hydrologic analyses of those streams. The TR-20 computer program computed discharge by frequency at various points in the watershed. Straight line interpolation based upon drainage area was used to obtain the discharge by frequency at each valley section. Discharges from the TR-20 computer program compared favorably with COE discharges and the frequency analysis computed at the Alpine Creek gage and the Moss Creek gage.

The regional regression equation for Region VI was used to compute the 100-year discharges for Toronto Creek and for Tributaries 1 and 3, which are almost completely rural. The equation for Region VI, which is based on an analysis of rural streams, is considered valid for these basins (Reference 4).

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
ALPINE CREEK		
At a point approximately 0.25 mile downstream of downstream limit of study	21.32	11,182
Upstream of confluence with West Moss Creek	18.84	10,456
At North 5th Street	18.52	10,612

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
ALPINE CREEK (continued)		
At Avenue D	18.43	10,656
At Avenue E	18.39	10,675
At Holland Avenue	18.35	10,695
At Southern Pacific Railroad	18.33	10,704
At Murphy Avenue	18.30	10,719
At upstream limit of study	17.23	11,240
WEST MOSS CREEK		
At its confluence with Alpine Creek	2.06	899
At Avenue B	1.83	861
At Avenue C	1.78	853
At Avenue D	1.68	837
At Avenue E	1.61	825
At Holland Avenue	1.56	817
At Southern Pacific Railroad	1.51	809
TRIBUTARY 1		
At South 13th Street	4.27	2,100
At Durrell Street	4.23	2,080
At Halbert Street	3.43	1,750
At upstream corporate limits	2.78	1,470
TORONTO CREEK		
At a point approximately 0.33 mile downstream of State Route 118	31.52	10,120
TRIBUTARY 3		
At a point approximately 200 feet upstream of the downstream corporate limits	1.02	1,120
At North 13th Street	0.99	1,100
At Access Road	0.80	980
At Plum Street	0.48	762
At exit to U. S. Route 90 West	0.28	605
MOSS CREEK		
At Southern Pacific Railroad	11.31	5,474
At breakout point into West Moss Creek	10.63	6,329

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

The hydraulic analyses for West Moss Creek, Moss Creek, and Alpine Creek were taken from the SCS report on flooding in the Alpine Creek watershed (Reference 2).

Cross sections used in the backwater analysis were field surveyed, synthesized based on terrain similarities and adjacent surveyed cross sections, or developed from 2-foot contour interval topographic maps (Reference 5).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the Flood Insurance Rate Map (Exhibit 2) where applicable.

Water-surface elevations of floods of the selected recurrence intervals for Alpine Creek, West Moss Creek, Moss Creek, and Tributary 1 were computed using computer programs WSP-2 and TR-20 (References 6 and 3). For Toronto Creek and Tributaries 1 and 3, water-surface elevations were computed using the WSPRO computer program (Reference 7). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for the backwater computations were based on slope-area computations.

An area of unusual flow conditions exists in the vicinity of the confluence of Tributary 3 and Toronto Creek. The Atchison, Topeka & Santa Fe Railroad embankment crosses the floodplains of both streams a short distance upstream of their confluence point. During large floods, an area of intermingled flow exists immediately upstream and downstream of the two railroad bridges. The railroad embankment is severely skewed to the direction of flow and has a slope of approximately 28 feet per mile from southwest to northeast in the vicinity of the two bridges. The Tributary 3 bridge opening is located upstream from and is significantly higher than the Toronto Creek bridge.

To route the 100-year discharge through the two bridges, two valley cross sections were developed, one downstream from the area affected by the two bridges and the other upstream of the affected area. The 100-year discharge was then divided at the downstream valley cross section and routed through the two railroad bridges independently. A trial and error procedure was used in dividing the discharge until the separate step-backwater runs yielded identical water-surface elevations at the common valley cross section upstream of the railroad bridges. For this area of divided (intermingled) flows,

water-surface elevations for that portion of the flow going through the tributary bridge are included on the profile for Tributary 3. The low-water confluence of the two streams is located approximately 590 feet downstream of the downstream valley cross section.

Channel roughness factors (Manning's "n") used in the hydraulic computations were assigned on the basis of engineering judgment and field inspection of the streams and floodplain areas. Channel and overbank "n" values for the streams studied by detailed methods are shown in the following tabulation.

Stream	Channel "n"	Overbank "n"
Alpine Creek	0.040-0.055	0.075-0.150
West Moss Creek	0.040-0.100	0.012-0.150
Moss Creek	0.040-0.060	0.080-0.090
Toronto Creek	0.055-0.080	0.065-0.090
Tributary 1	0.060-0.065	0.060-0.065
Tributary 3	0.045-0.080	0.045-0.080

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the streams studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 40 feet (Reference 8).

For the streams studied by approximate methods, the 100-year floodplain boundaries were delineated using the Flood Hazard Boundary Map for the City of Alpine (Reference 9).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

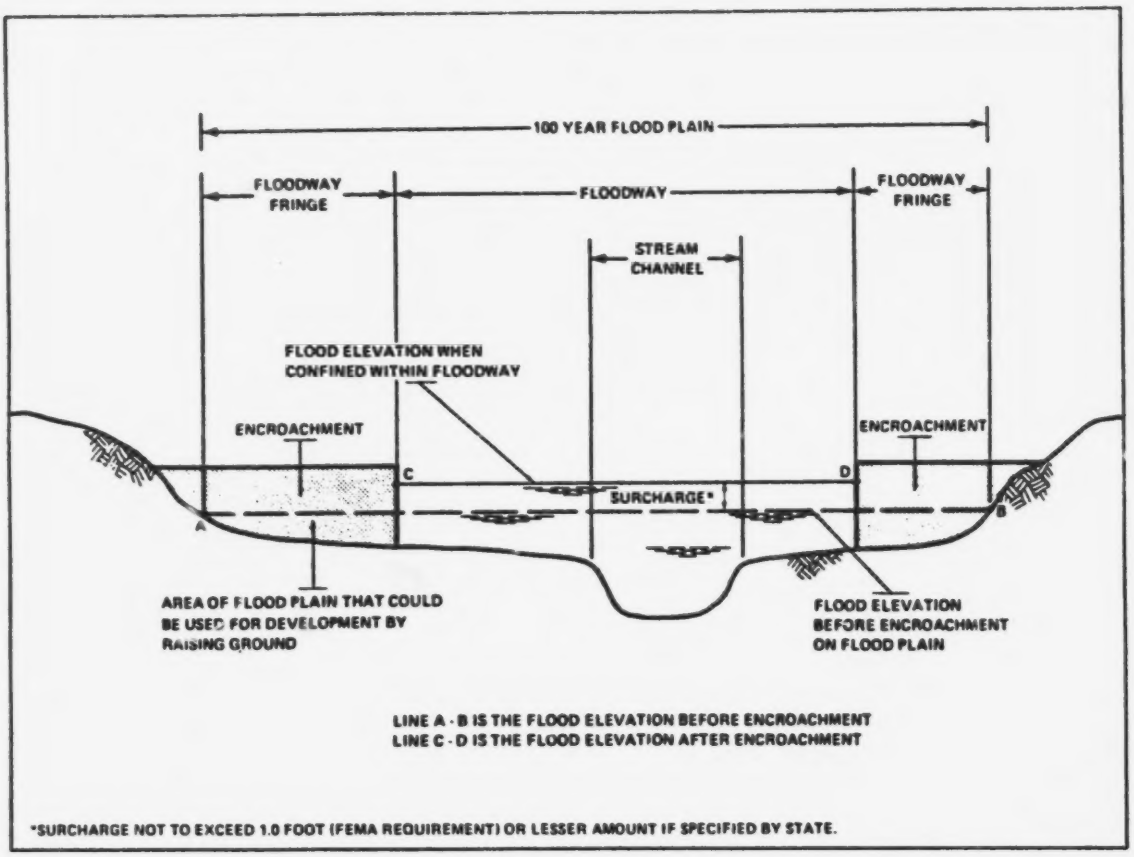
No floodways were calculated as part of this study.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 2

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplain. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

7.0 OTHER STUDIES

A Flood Insurance Study has been prepared for the unincorporated areas of Brewster County (Reference 10). Because they are based on more detailed analyses, the results of this study are not in exact agreement with the results of that study.

Because it is based on more up-to-date analyses, this study supersedes the Flood Hazard Boundary Map for the City of Alpine (Reference 9).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Federal Regional Center, 800 North Loop 288, Denton, Texas 76201-3698.

9.0 BIBLIOGRAPHY AND REFERENCES

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6. U. S. Department of Agriculture, Soil Conservation Service, Technical Release No. 61, WSP-2 Computer Program, Washington, D. C., May 1976.

7. U. S. Federal Highway Administration, Report FHWA/RD-86/108, Bridge Waterways Analysis Model/Research Report by J. O. Shearman, W. H. Kirby, V. R. Schneider, and H. N. Flippo, Jr., Washington, D. C., 1986.

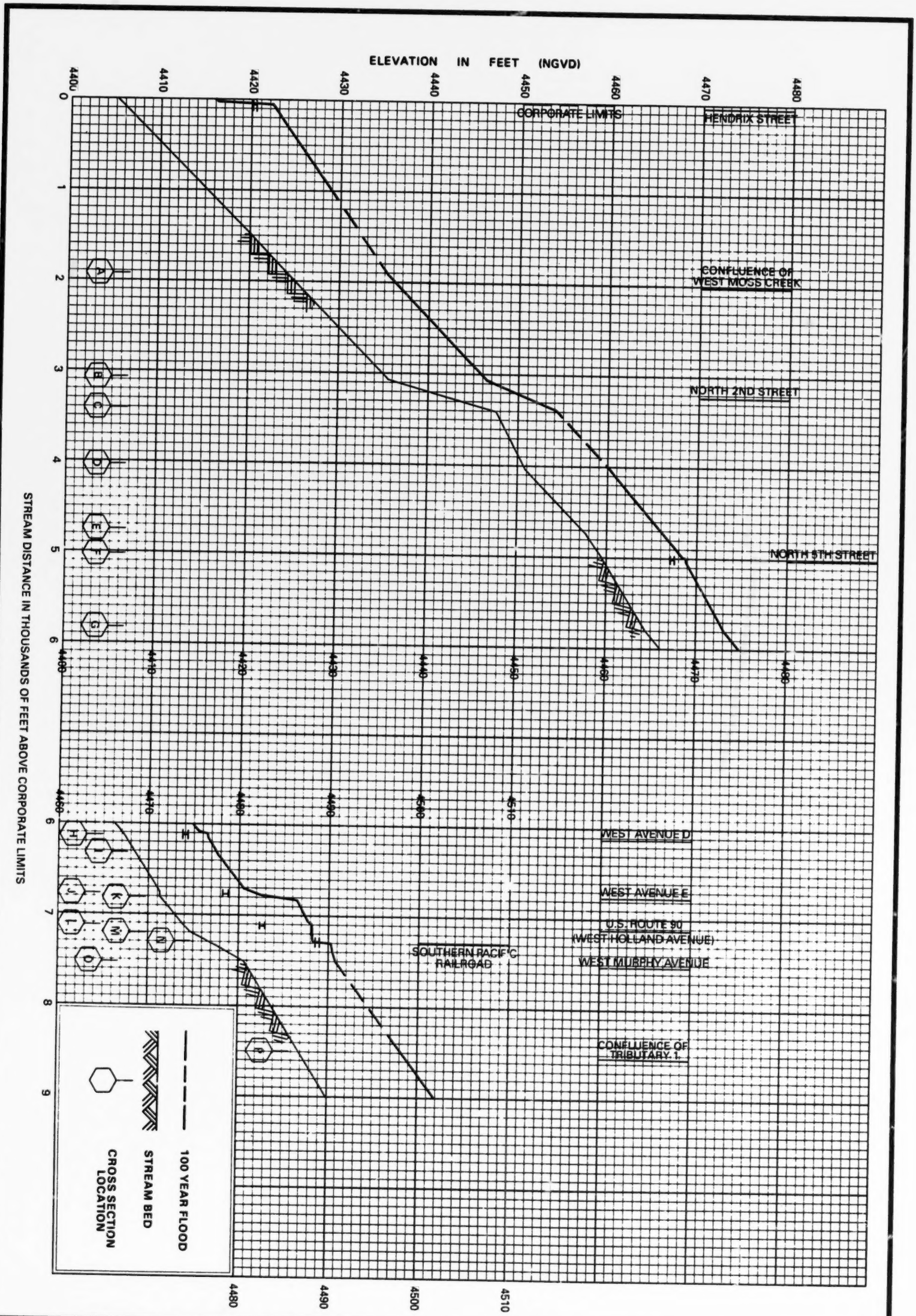
8. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 40 Feet: Alpine South, Texas; Alpine North, Texas, 1972.

9. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Alpine, Brewster County, Texas, April 9, 1976.

10. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Brewster County, Texas, Washington, D. C., October 15, 1985.

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 1	02	4,503.51	Standard USGS disk set in edge of square concrete slab of abandoned stream gaging station at upstream side of West Avenue G low-water crossing of Alpine Creek near top of west bank of creek.
RM 2	02	4,520.92	Standard USC&GS disk, stamped S 1103, set in top of concrete post protruding 7 inches above ground, located approximately 0.8 mile southwest along Southern Pacific Railroad from station at Alpine, approximately 49 feet southeast of milepost 608 and approximately 1 foot below level of track.
RM 3	02	4,452.75	Standard USC&GS disk, stamped E 114, set in top of concrete post flush with asphalt surrounding, located in southwest corner of parking area approximately 70 feet east of centerline of State Route 118 and near west entrance to State Highway Department office building, approximately 1.5 miles northwest of Southern Pacific Railroad station in Alpine.
RM 4	02	4,465.07	40D nail in east side of power pole, approximately 1 foot above ground, at intersection of Alpine Avenue and North 7th Street, in northwest quadrant of T-intersection.
RM 5	02	4,475.33	40D nail approximately 1 foot above ground in southwest side of power pole at intersection of Fort Davis Avenue and North 10th Street, on north side of Fort Davis Avenue, at point where it intersects with North 10th and North 11th Streets.
RM 6	02	4,499.80	40D nail approximately 1 foot above ground in power pole in southeast quadrant of T-intersection at west end of Del Rio Avenue and access road.
RM 7	02	4,518.09	40D nail approximately 1 foot above ground in power pole on east side of Plum Street, approximately 100 feet north of intersection of Plum Street and Uvalde Avenue.



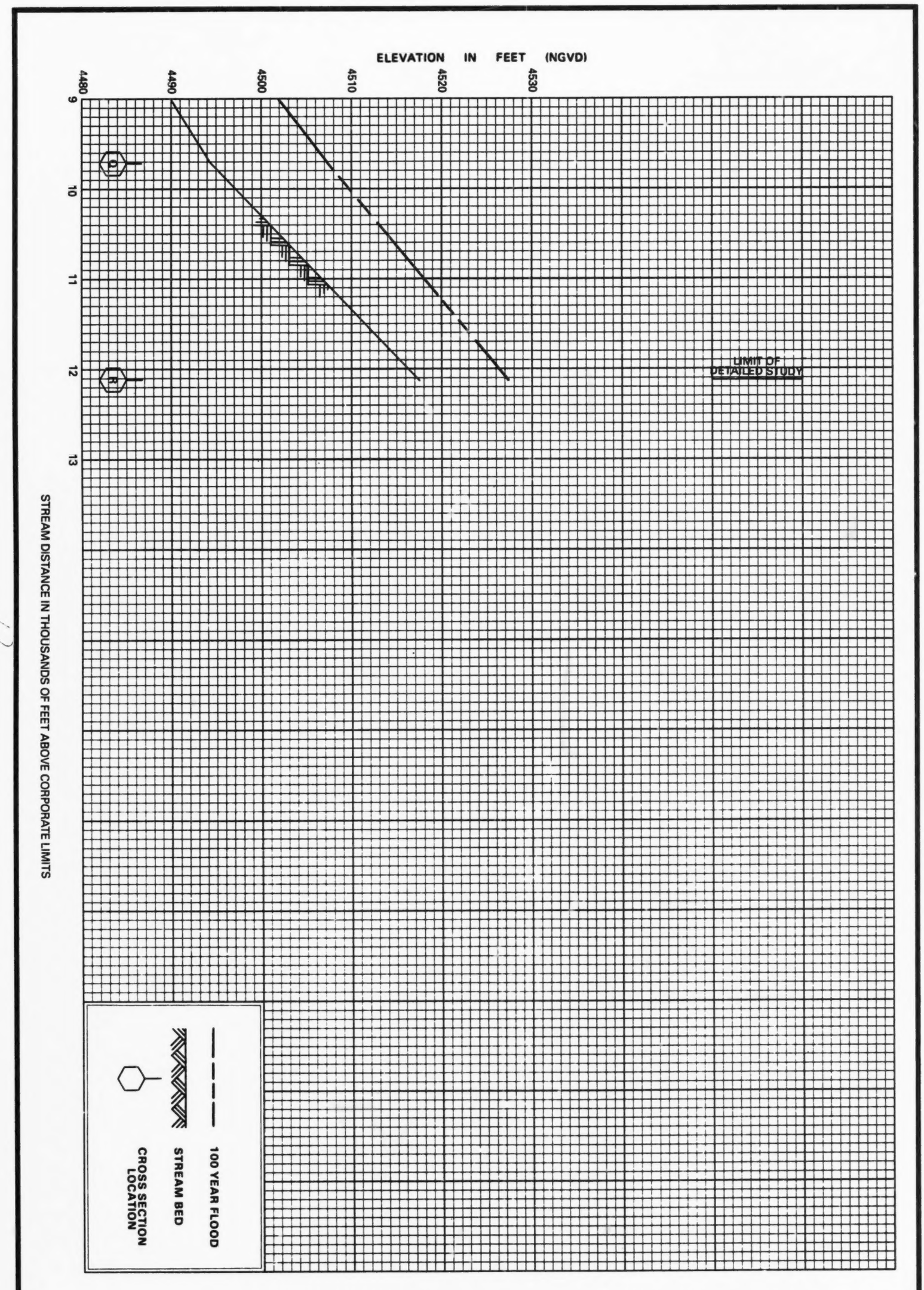
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALPINE, TX
(BREWSTER CO.)

FLOOD PROFILES

ALPINE CREEK

01P



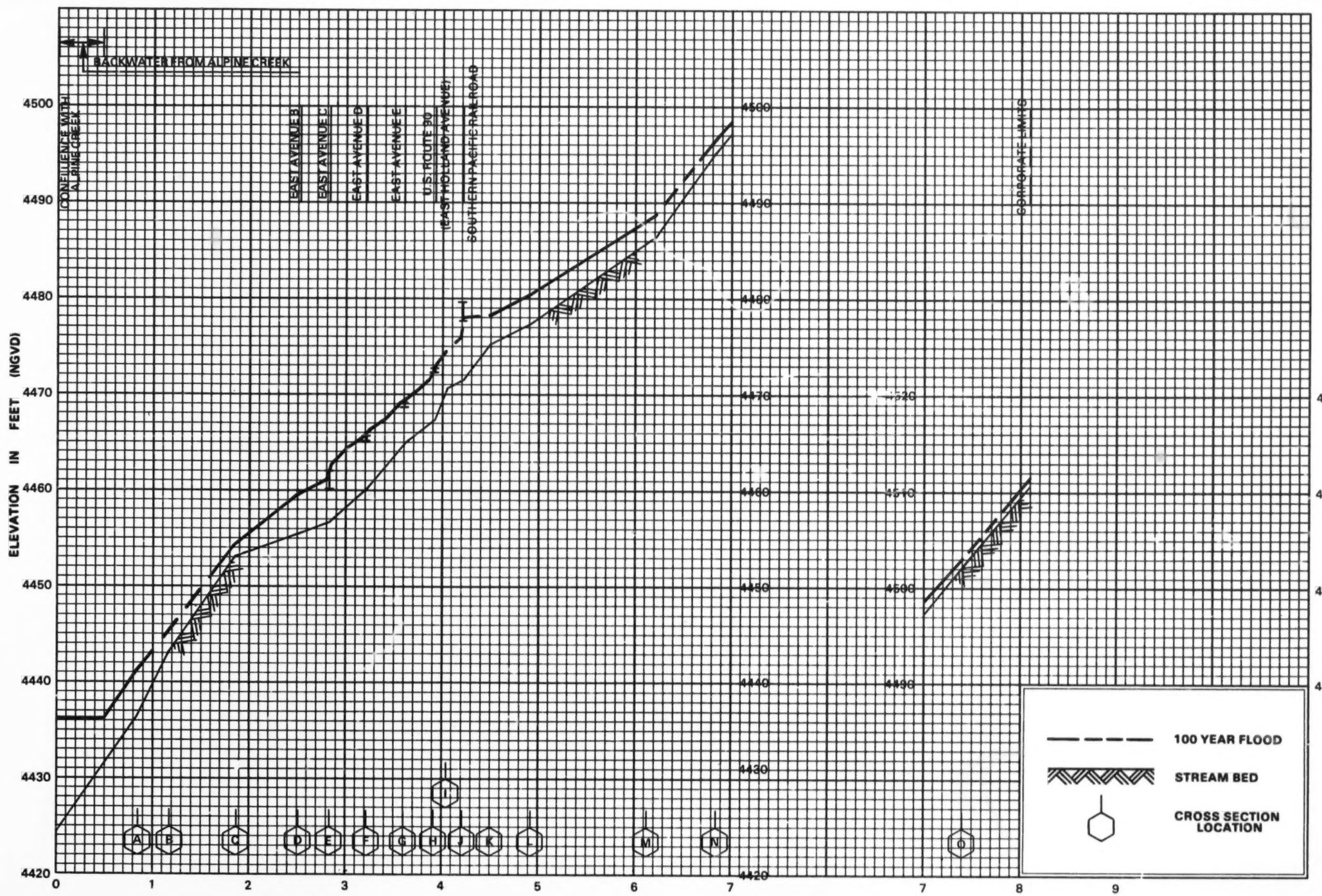
02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALPINE, TX
(BREWSTER CO.)

FLOOD PROFILES

ALPINE CREEK



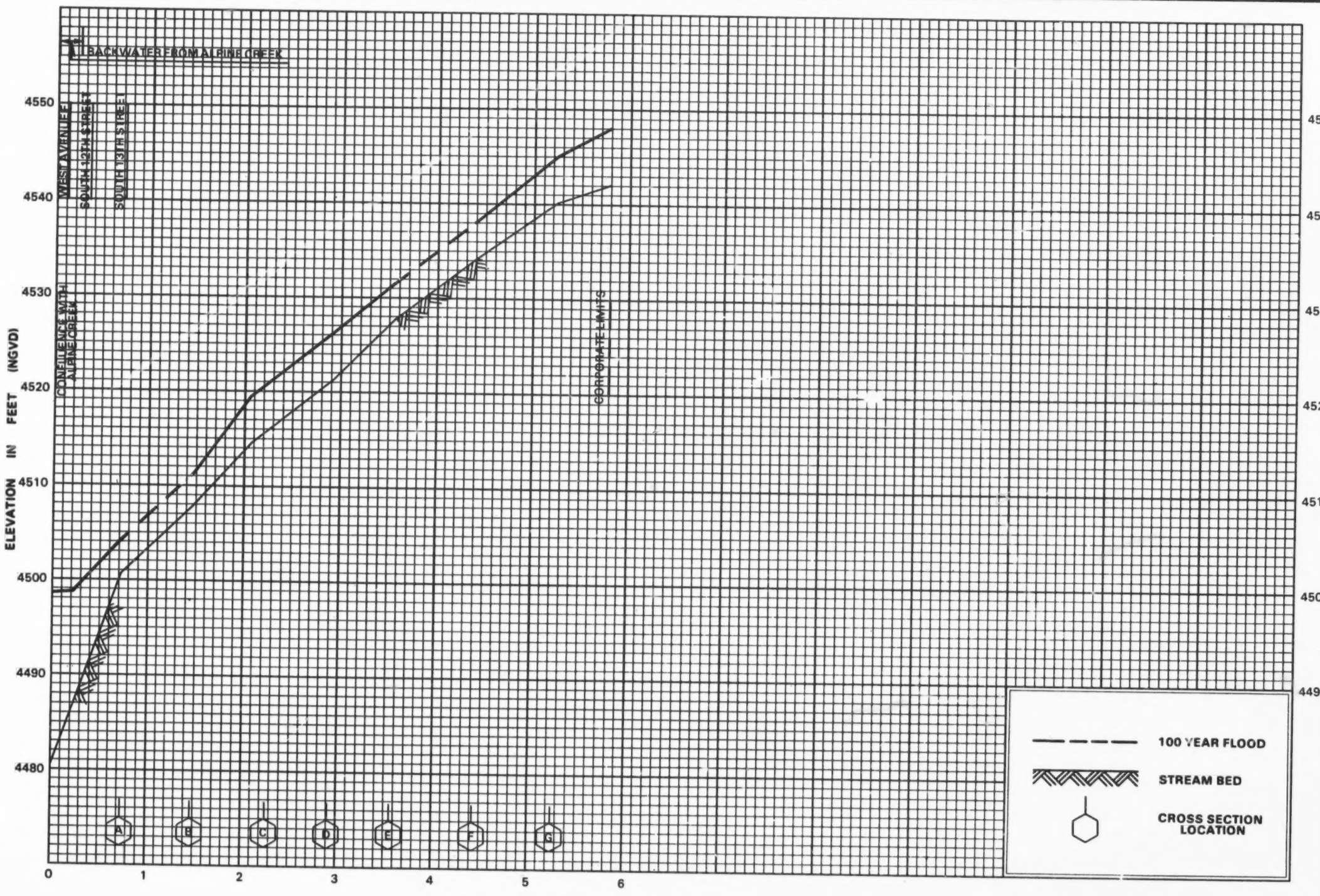
FLOOD PROFILES

WEST MOSS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALPINE, TX
(BREWSTER CO.)

03P



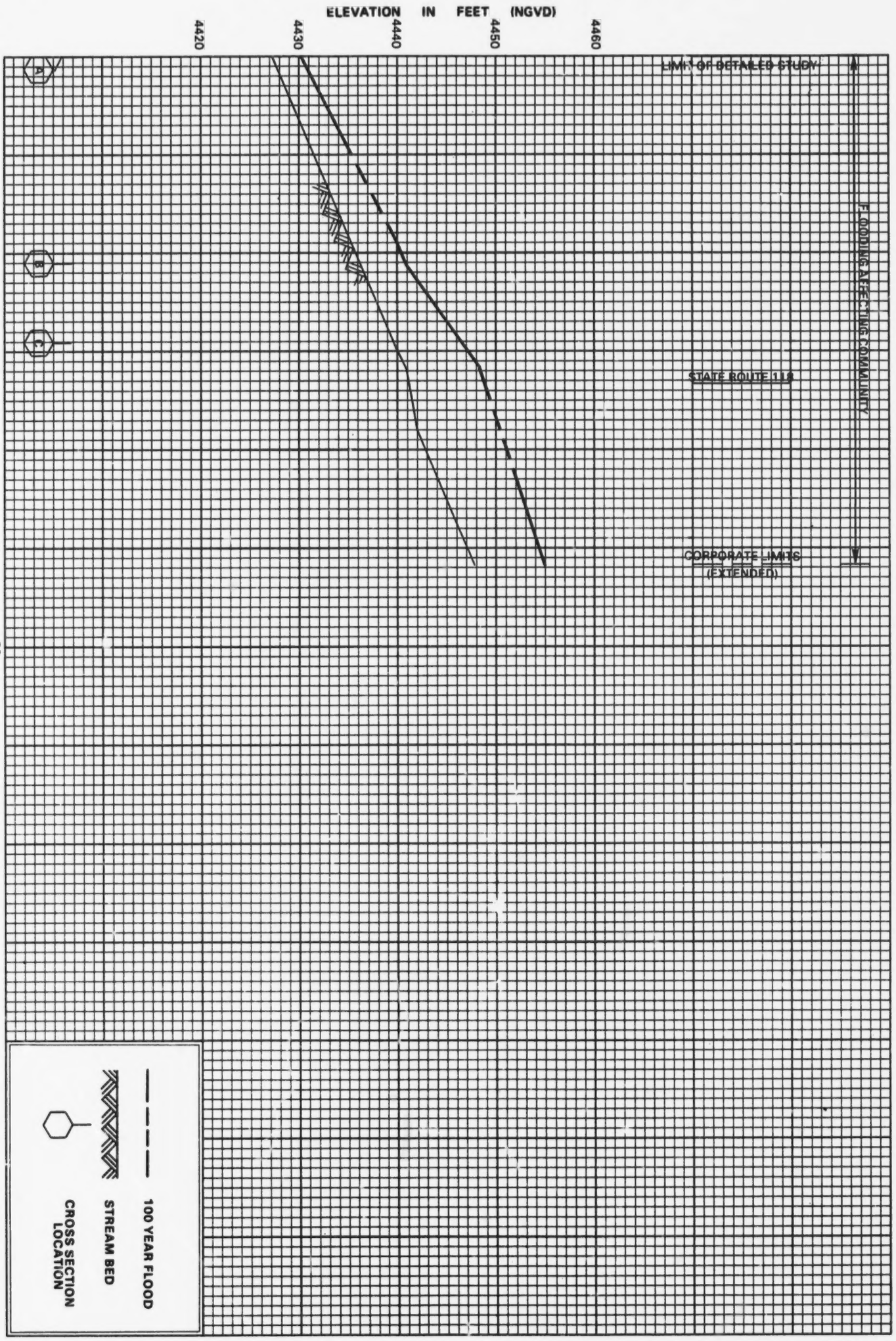
FLOOD PROFILES

TRIBUTARY 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

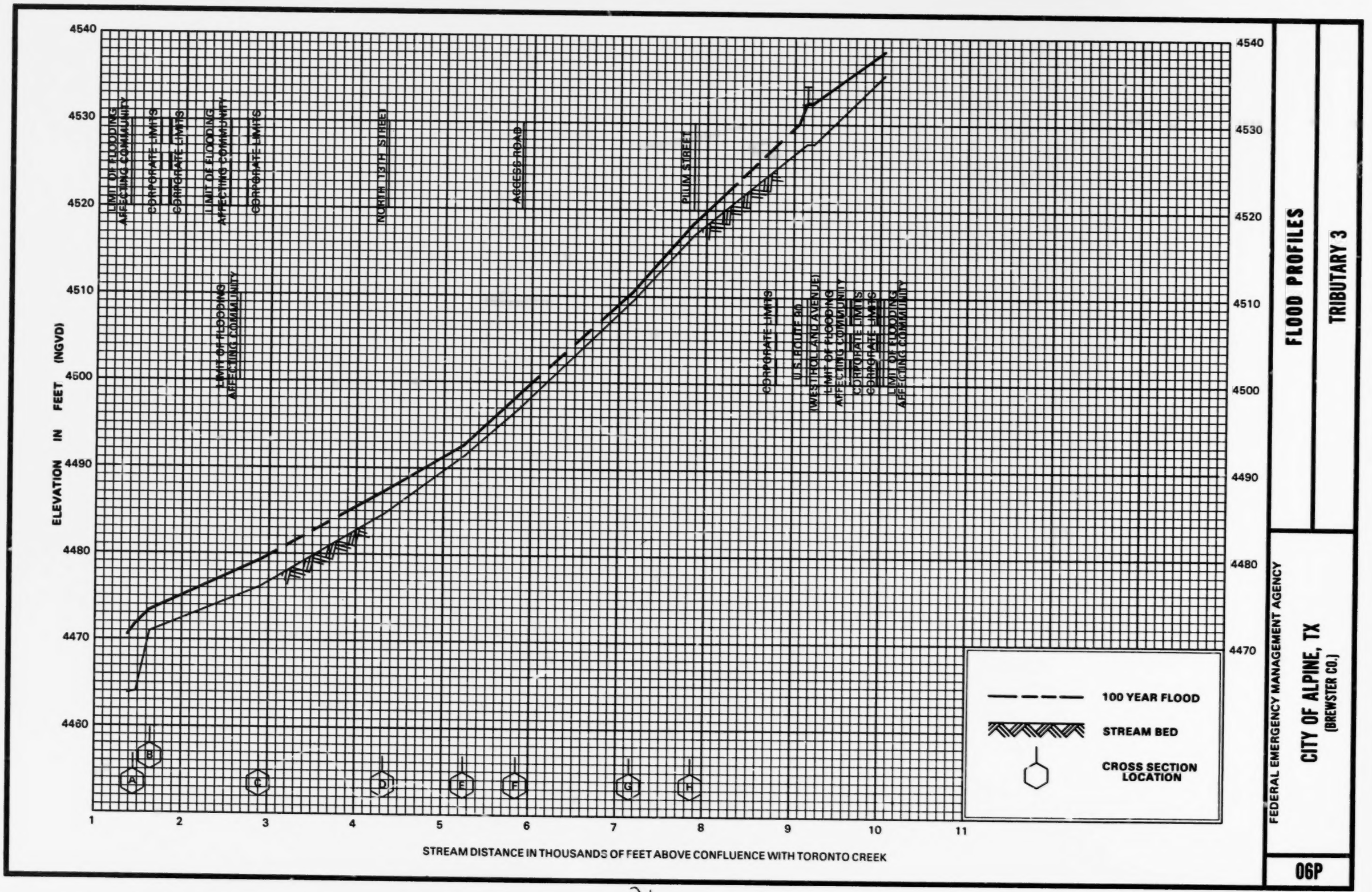
CITY OF ALPINE, TX
(BREWSTER CO.)

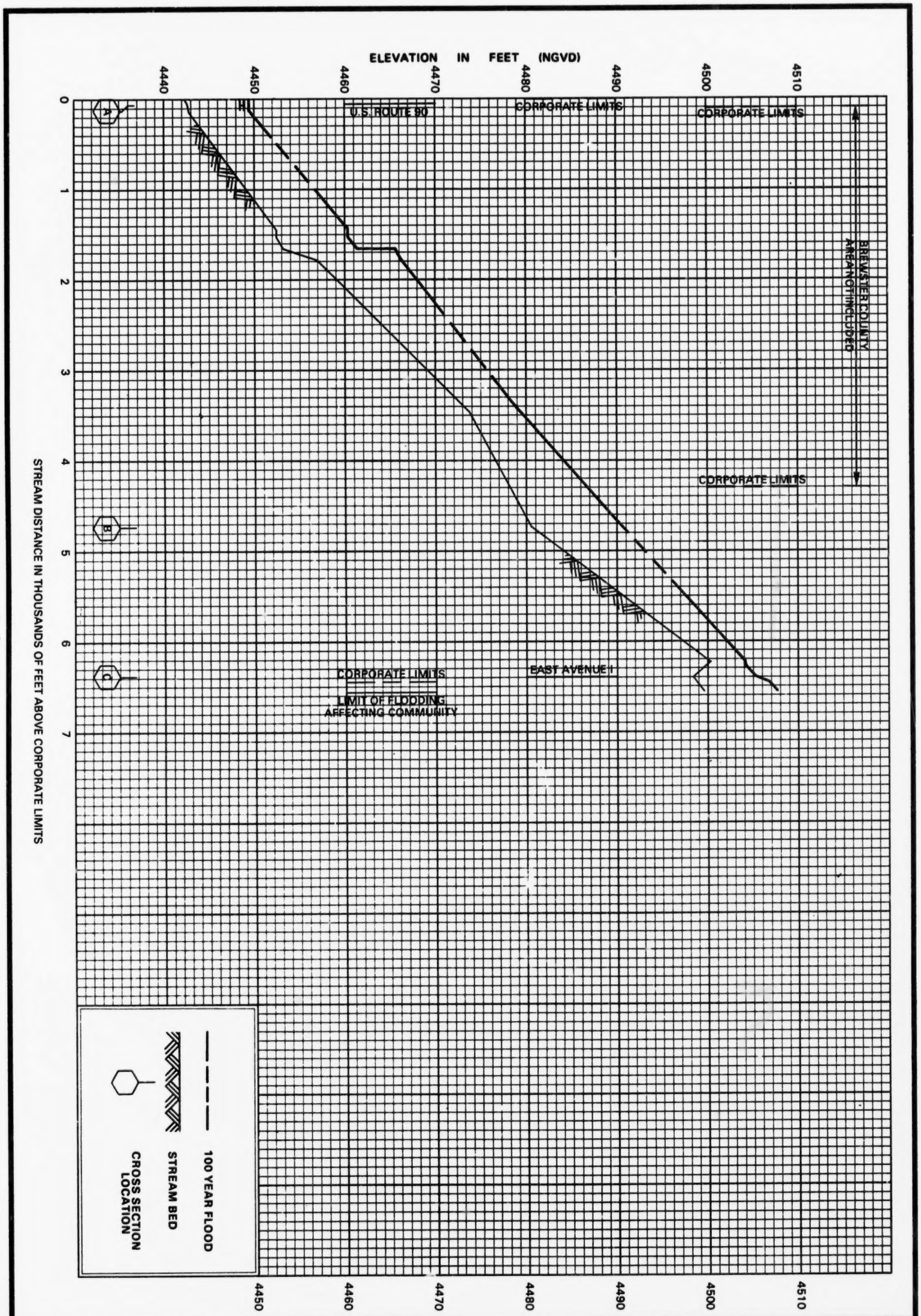
04P



05P	FEDERAL EMERGENCY MANAGEMENT AGENCY CITY OF ALPINE, TX (BREWSTER CO.)	FLOOD PROFILES TORONTO CREEK

20


4540
4530
4520
4510
4500
4490
4480
4470
4460
ELEVATION IN FEET (NGVD)
LIMIT OF FLOODING AFFECTING COMMUNITY
CORPORATE LIMITS
CORPORATE LIMITS
LIMIT OF FLOODING AFFECTING COMMUNITY
CORPORATE LIMITS
LIMIT OF FLOODING AFFECTING COMMUNITY
NORTH 13TH STREET
ACCESS ROAD
PULLIM STREET
CORPORATE LIMITS
U.S. ROUTE 90 (WESTHOLLAND AVENUE)
LIMIT OF FLOODING AFFECTING COMMUNITY
CORPORATE LIMITS
CORPORATE LIMITS
LIMIT OF FLOODING AFFECTING COMMUNITY
A
B
C
D
E
F
G
H
1
2
3
4
5
6
7
8
9
10
11
STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE WITH TORONTO CREEK
100 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
TRIBUTARY 3
FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF ALPINE, TX
(BREWSTER CO.)
06P



FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF ALPINE, TX
(BREWSTER CO.)

FLOOD PROFILES

MOSS CREEK

07P